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IS/QC 160000-2 (1988): Electrical Relays, Part 2:
Application of the IEC Quality Assessment System for
Electronic Components to All-or-Nothing Relays [ETD 35:
Power Systems Relays]



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Indian Standard

SPECIFICATION FOR ELECTRICAL RELAYS

Part 2 Application of the IEC Quality Assessment System for Electronic Components to All-or-Nothing Relays

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NEW DELHI 110002

Indian Standard

SPECIFICATION FOR ELECTRICAL RELAYS
Part 2 Application of the IEC Quality Assessment System for Electronic Components to All-or-Nothing Relays

National Foreword

This Indian Standard (Part 2), which is identical with IEC Pub 255-10 (1979) 'Electrical relays: Part 10 Application of the IEC quality assessment system for electronic components to all-or-nothing relays' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Relays Sectional Committee (ETDC 35) and approval of the Electrotechnical Division Council.

This standard is intended primarily for use under the IECQ system. A regular Indian Standard for this component could be different, identical or similar to this standard.

Wherever the words 'International Standard' appears referring to this standard, they should be read as 'Indian Standard'.

Cross References

In this Indian Standard, the following International Standards are referred to. Please read in their respective places the following:

Corresponding Indian Standard

IS QC 001001 : 1988 Basic rules of the IEC Quality assessment system for electronic components (IECQ) (*Identical*)

IS QC 160000 (1) : 1988 Specification for electrical relays: Part 1 Test and measurement procedures for electromechanical all-or-nothing relays (*Identical*)

International Standard

IEC Pub 572-1977/QC 001001 : 1986 Basic rules of the IEC Quality assessment system for electronic components (IECQ)

IEC Pub 255-7 (1978) Specification for electrical relays: Part 7 Test and measurement procedures for electromechanical all-or-nothing relays

The technical committee responsible for the preparation of this standard has reviewed the provisions of the following IEC standards and has decided that they are acceptable for use in conjunction with this standard:

IEC Pub 255-0-20 (1974) Electrical relays—Contact performance of electrical relays.

IEC Pub 255-5 (1977) Electrical relays, Part 5 Insulation tests for electrical relays.

IS QC 160000 (Part 2) : 1988
IEC Pub 255-10(1979)

IEC Pub 410 (1973) Sampling plans and procedures for inspection by attributes.

IEC Pub 419 (1973) Guide for the inclusion of lot-by-lot and periodic inspection procedures in specifications for electronic components (or parts).

Only the English language text given in the IEC Publication has been retained while adopting it as Indian Standard.

1. Scope and object

This report applies to all-or-nothing relays. It provides guidelines for:

- a) qualification and quality conformance procedures;
- b) the classification of relays;
- c) the grouping of tests;
- d) making test schedules;
- e) the application of the Items a), b), c) and d) in preparing sectional documents and detail specifications. These guidelines are intended to be used within the IEC quality assessment system.

2. Terms and definitions

Reference should be made to the other IEC publications of the 255 series and to the International Electrotechnical Vocabulary (I.E.V.) (IEC Publication 50), Chapter 446.

3. Introduction

The basic concept of the IEC quality assessment system is to provide assurance to the purchasers that the relays which are released conform to the requirements in the detail specifications.

All the tests shall be conducted under the responsibility of the chief inspector nominated by the manufacturer.¹

The procedures comprise the following consecutive basic steps:

- a) qualification approval;
- b) quality conformance inspection.

For relays manufactured in small quantities, in isolated lots, or in short production runs, special procedures are applicable (see Appendix C).

For each test in the test schedule, the detail specification shall indicate whether the test has to be carried out as part of the qualification approval tests, as part of the lot-by-lot inspection, or as part of the periodic inspection.

Where any discrepancies occur for any reason, documents shall rank in the following order of authority:

- 1) the customer's contractual requirements;
- 2) the detail specification;
- 3) the generic specification;
- 4) the basic rules documents applying to the quality assurance scheme.

The same order of precedence shall apply to equivalent national documents.

¹ At the time of printing, Clauses 9, 10 and 11 of Documents CMC(Secretariat)35 and 36 were under consideration.

4. Qualification approval procedure

The qualification approval tests of a relay-type are the complete series of tests to be carried out on a number of relays, with the object of determining whether a particular manufacturer can be considered capable of producing relays meeting the detail specification.

The qualification approval tests comprise all the tests indicated in the detail specification including the lot-by-lot and periodic tests. Qualification approval shall be based on conformance with the requirements of the qualification approval tests only and:

Method 1: For short production runs the conformance with the requirements of the test specifically prescribed in the detail specification for this purpose.

Method 2: For continuous production and large production runs the conformance with the requirements of the tests in the detail specification achieved for three consecutive lots subjected to lot-by-lot inspection for Groups A and B tests and on a lot (drawn from the three accepted lots) subjected to the Group C periodic inspection (using the average lot size for the three lot-by-lot inspections to determine the sample size).

The samples shall be taken from the lots according to IEC Publication 410, Sampling Plans and Procedures for Inspection by Attributes.

Normal inspection shall be used, but where the sample size would give acceptance on zero defectives, additional specimens shall be taken to meet the sample size required to give acceptance on one or more defectives. When Method 1 is applied, the detail specification shall state the sample size and the associated permissible number of defectives, together with the amount of endurance testing. These shall pay due regard to the limiting quality of the sampling plan to be used and shall be as agreed between manufacturer and purchaser.

Note. — Since the confidence in the results of the qualification approval tests is not only derived from the statistical inferences but also is based on the overall technical information and taking into account the costs involved in qualification approval testing, the detail specification may select the smallest possible sample sizes within the rules.

The sample sizes and accept/reject numbers shall be selected from the sampling plans given in IEC Publication 410 and as a general rule the sample size shall not be less than 5 for any group of tests.

5. Quality conformance inspection

After qualification approval has been obtained the manufacturer is responsible for ensuring that no major technical changes are introduced for the product without re-qualification being made and that the quality conformance inspection prescribed by the specification is carried out. This inspection is divided into two parts:

- That carried out lot by lot and on which the release of the individual lots is based.
- That (containing the time-consuming and more expensive tests) carried out on a periodic basis.

Quality conformance inspection is based on conformity with the requirements of the tests mentioned in the detail specifications as lot-by-lot tests and periodic tests.

Tests in sub-group A0 (see Appendix A) should always precede all other non-destructive tests.

Tests in sub-group A0 should always precede all destructive tests. Each test shall be conducted on a relay not previously subjected to any destructive or non-destructive test liable to invalidate the result of the test being undertaken. Otherwise, subject to any specific restrictions given in the detail specification, a destructive test may be preceded by one or more non-destructive tests.

6. Rules for sampling

Sampling shall be carried out in accordance with the sampling plans and procedures given in IEC Publication 410, using per cent defective concept only.

The inspection levels specified in the sectional documents shall be selected in accordance with Sub-clause 9.2 of IEC Publication 410.

For each particular sub-group, the same inspection level is used in all the different test schedules.

The standard inspection levels will apply normally but higher levels can be specified where greater confidence is required in the conformance.

For each test in a sub-group, a random sample shall be taken in accordance with the sampling plan obtained from IEC Publication 410 for the inspection level and acceptable quality level prescribed for that sub-group.

Stratified sampling should always be used to include all production lines and structurally similar items in proportion to their respective quantities in the lot.

Samples for Group C inspection shall be taken from a lot (or lots) which has (have) passed Groups A and B inspection. They can be taken either from the lot which leaves production at the end of the Group C period or from different lots at intervals during the Group C period. In either case, the sample size shall be not less than that applicable to the average lot size in the current Group C period.

Specimens should be as representative as possible of the production.

7. Classification of relays

Various attempts to classify relays solely by type, technology, application or use, have proved abortive due to similarities and interdependence in their various characteristics and this report classifies relays according to different test schedules; these schedules are based on experience and are characterized by the number of mandatory tests in the schedule and their distribution over the various sub-groups.

The rules for grouping of tests are given in Clause 9 and in Appendix A. The test schedules constructed according to the rules for grouping of tests can be found in Appendix B.

In test schedule 1 the number of mandatory tests is limited. In test schedules 2 and 3 there is an increase in the number of mandatory tests.

8. Guidelines for writing sectional specifications

Three sectional specifications can be prepared, each using one of the test schedules. Each sectional specification can then be used as a guide in writing detail specifications.

The sectional specification contains proposals for the inspection levels and preferred acceptable quality level values for each test. The test schedules take account of the technology of the relay and of the contact application by indicating the applicability with respect to technology and contact application.

The most general categories of technology and contact application are given in Table I. This table shall form part of the sectional document. When the characteristics of the contact cannot be classified in one or more of the stated categories, or when particular tests are required, the detail specification shall give the necessary indications.

The detail specification shall state the relevant properties chosen from this table.

TABLE I

Relay properties

Categories	Brief definition	Notation	Remarks
Relay technology 0	Non-sealed contacts	RT 0	One of three applies
Relay technology 1	Sealed contacts	RT I	
Relay technology II	Sealed relays	RT II	
Contact application 0	$U \leq 0.03 \text{ V}; I \leq 0.01 \text{ A}$	CA 0	At least one of four applies
Contact application 1	$0.03 < U \leq 60 \text{ V}; 0.01 < I \leq 0.10 \text{ A}$	CA 1	
Contact application 2	$5 < U \leq 250 \text{ V}; 0.10 < I \leq 1.0 \text{ A}$	CA 2	
Contact application 3	$5 < U \leq 600 \text{ V}; 0.10 < I \leq 100 \text{ A}$	CA 3	

- Notes 1. – The specification pertaining to the contact application categories is stated in Clause 9 of IEC Publication 255-7, Part 7: Test and Measurement Procedures for Electromechanical All-or-nothing Relays.
2. – Environmental conditions are common to all test schedules, therefore they are not categorized in this table.

9. Rules for the grouping of tests

9.1 Principles adopted

The purpose of grouping of tests is to combine in one group all those tests which are of equal importance to the assessment of the usefulness of the relay. Therefore each test in the same sub-group gets the same inspection level and acceptable quality level range and therefore further criteria for the allocation of tests to a group are the destructiveness of the test, the duration of the test, and the relation to fabrication or design.

The frequency of testing takes account of the complexity, duration and overall cost of the test and the effect of releasing non-conforming relays.

Characteristics tested at the same frequency and having similar importance to the function of the relay are combined into the same sub-group.

9.2 Grouping

The tests shall be divided into Groups A, B and C in accordance with the principles given in Sub-clauses ... and ... IEC Publication ...¹ and with "periodic inspection" as defined in Sub-clause 2.6 of IEC Publication 419, Guide for the Inclusion of Lot-by-lot and Periodic Inspection Procedures in Specifications for Electronic Components (or Parts). Subdivision of each group is made according to the definitions given in Appendix A and each test requirement should be allotted to a sub-group according to the relative importance of the feature tested to the overall function of the relay.

9.3 Definition of groups

Group A: Tests in this group comprise non-destructive short-duration electrical and mechanical test procedures which are employed to assess, on a lot-by-lot basis, the principal characteristics of the relays determined mainly by the fabrication process, and those which are of a design nature and are of vital importance.

Group B: Tests in this group comprise both destructive and non-destructive test procedures, with a duration of about one week, which are employed to assess, on a lot-by-lot basis, the characteristics of the relay determined mainly by the fabrication process and which are of vital or major importance or are of a design nature and of vital importance.

Group C: Tests in this group comprise both destructive and non-destructive test procedures that are applied periodically to confirm that certain characteristics, in addition to those already included in Groups A and B, are being maintained. These characteristics may be related either to design or to the fabrication processes and can be of vital, major or minor importance to the function of the relay (see Appendix A for guidance on what constitutes vital, major and minor importance in each group).

10. Rules for writing detail specifications

For preparing detail specifications, the following procedure should be adopted:

1. Select from Table I of the present report the properties of the relay relevant for its intended use.
2. Select the test schedule which most closely satisfies the requirements for the intended use of the relay.
3. Include in the detail specification all the mandatory tests which are prescribed in the selected test schedule, together with those recommended tests considered appropriate for the intended use.
4. If necessary, add any other test required in addition to these recommended tests.
5. Recommended tests and added tests become mandatory if included in the detail specification.
6. The detail specification shall state which tests shall be carried out at qualification approval only.
7. For each test the detail specification shall indicate whether this test is destructive or non-destructive.

Examples of test schedules 1, 2 and 3 are given in Appendix D for a typical relay with non-sealed contacts (RT 0) and the contact loads in categories 0 and 1 (CA 0 and CA 1).

¹ Being prepared. Reference at the time of printing is: Sub-clauses 11.3.1 and 11.3.2 in Document CMC(Secretariat)36.

APPENDIX A

RULES FOR THE GROUPING OF TESTS

A1. Description of the method

This method of grouping is illustrated in the attached diagram. The tests are first separated into two sets, one comprising all the non-destructive and the other all the destructive tests (see note). These two sets are then segregated according to whether a test can be conducted in one week or takes longer than a week to complete (duration of test). For tests whose duration does not exceed one week, then lot-by-lot inspection is possible and for short duration non-destructive test 100% inspection could be applied. Tests exceeding one week shall be conducted on a periodic basis. Within each of these subdivisions, either the characteristic of the relay being tested is completely or predominantly determined by the materials and manufacturing processes employed or it is, essentially related to the design. Where it is not clear whether the characteristic is principally related to fabrication or design, then due weighting should be given to the process variability (see Appendix B, Note 1).

Thus the tests can be further categorized accordingly. For each of the test categories thus formed, the relative importance of the feature being tested to the function of the relay is the only factor remaining to be decided. The classification (vital, major, minor) and the frequency of testing, which together reflect the importance, determine the sub-group to which the test should be allocated.

The tests can now be collected together in their respective sub-groups and listed in a test schedule.

Each detail specification shall include a test schedule indicating the division and allotment of the appropriate tests into sub-groups for the purpose of lot-by-lot and periodic inspection.

Note. — All the group A tests are non-destructive, but when preparing a detail specification, a decision shall be made for each test included in Group B and Group C whether the test is to be considered destructive or non-destructive and this shall be indicated in the test schedule included in the detail specification.

A2. Definition of sub-groups

Sub-group A0: This sub-group comprises short-duration tests for features which are of vital importance to the function of the relay.

Except for certain special applications, prescribed in the detail specification, 100% testing shall be carried out as a screening or sorting function, possibly on-line, prior to the formation of lots from which samples for the other sub-groups are taken.

Sub-group A1: This sub-group comprises short-duration tests for important (major) characteristics of the relay.

Sub-group A2: This sub-group comprises short-duration tests for the less important (minor) characteristics of the relay.

Sub-group A3: This sub-group comprises short-duration tests for features involving a high degree of subjective judgement, such as visual inspection.

Sub-group A4: This sub-group comprises short-duration tests for characteristics which are essentially related to design only and are of vital importance to the function of the relay.

Sub-group B1: This sub-group comprises tests of about one week's duration and applies to characteristics which are of vital importance to the function of the relay.

Sub-group B2: This sub-group comprises tests of about one week's duration for important (major) characteristics of the relay.

Sub-group B3: This sub-group comprises tests of about one week's duration which apply to characteristics which are of vital importance to the function of the relay but are essentially related to design.

Sub-group C1: This sub-group comprises tests that apply to characteristics which are of vital importance to the function of the relay. Normally the assessment period shall not exceed six months.

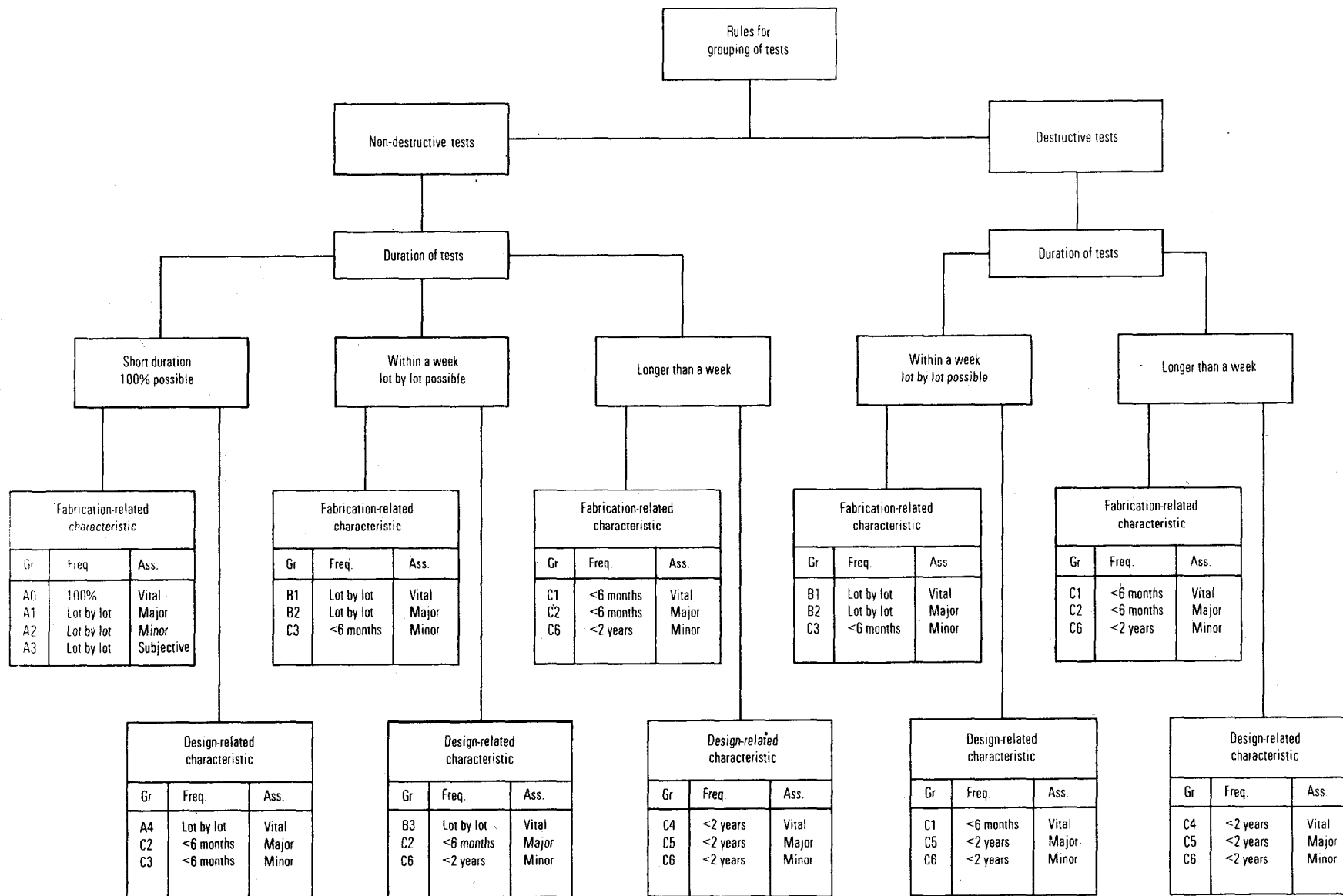
Sub-group C2: This sub-group comprises tests that apply to important (major) characteristics of the relay. Normally the assessment period shall not exceed six months.

Sub-group C3: This sub-group comprises tests that apply to the less important (minor) characteristics of the relay. Normally the assessment period shall not exceed six months.

Sub-group C4: This sub-group comprises tests that apply to characteristics which are of vital importance to the function of the relay. Normally the assessment period shall not exceed two years.

Sub-group C5: This sub-group comprises tests that apply to important (major) characteristics of the relay. Normally the assessment period shall not exceed two years.

Sub-group C6: This sub-group comprises tests that apply to the less important (minor) characteristics of the relay. Normally the assessment period shall not exceed two years.



Note. — There is no sub-group for CTR data. This information should be included in the section of the document actually dealing with certified test results (CTR).

APPENDIX B

TEST SCHEDULES

B1. Description

All the mandatory and recommended tests listed in test schedule 1 are also included in test schedule 2, plus some further tests. Likewise the tests of test schedule 2 are again included in test schedule 3, plus still further tests. In a few cases, tests are shifted from one group to another, or recommended tests become mandatory when proceeding from test schedule 1 to the higher ones.

Such shifting and changes are marked by an asterisk (for example M *).

The following notes are used in the test schedules (for additional notation see foot of Table I).

Notes 1. — These tests are to be carried out in this test group when either of the following situations applies:

- i)* When the parameter concerned is vital to the successful operation of the relay in its intended use.
- ii)* When the manufacturing variability is comparable to the specified tolerance range for a stated parameter, and when any relay with characteristics outside these limits would have an adverse effect in its intended use.
2. Only applicable when agreed upon between manufacturer and user and when the test duration does not exceed one week.
3. Only applicable when agreed upon between manufacturer and user.
4. Combination of electrical and mechanical endurance is allowed when the required number of operations for one of the electrical endurance tests is at least equal to the number of operations required for mechanical endurance.

B2. Order of tests

The tests in each sub-group are listed in the order of the numbering of clauses in IEC Publication 255-7. For the order in which tests will have to be carried out, see Clause 5 of this report.

Clause	Test	Test schedule 1		Test schedule 2		Test schedule 3	
	<i>Sub-group A0</i>						
17.4	Visual inspection, marking	M		M		M	
19.1	Coil resistance					M*	If Notes 1 and/or 3 apply
20	Dielectric test	M	Detail specification shall state reduced number of terminals	M	Detail specification shall state the terminals if note 1 applies	M	Detail specification shall state the terminals if note 1 applies
23	Contact-circuit resistance			M	Only for CA 0	M	Only for CA 0
24	Functional tests	M	Operate and release value for RT I and RT II only	M	Operate and release value for RT I and RT II only	M	Operate and release value for RT I and RT II only
31.2	Sealing	M	Only for RT II	M	Only for RT II	M	Only for RT II
	<i>Sub-group A1</i>						
18.1	Mechanical test procedures			R		R	
19.1	Coil resistance	M	Only for d.c. relays	M	Only for d.c. relays	M	Only if not already in A0
19.3	Coil impedance	M	Only for a.c. relays	M	Only for a.c. relays	M	Only for a.c. relays
23	Contact-circuit resistance			M	Only for CA 1	M	Only for CA 1
24	Functional tests	M	Operate and release value for RT 0 only	M	Operate and release value for RT 0 only	M	Operate and release value for RT 0 only
25	Timing tests					R*	If Notes 1 and 3 apply
32	Internal moisture			R*	Only for RT II and CA 0 both combined	M*	Only for RT II and CA 0 both combined
	<i>Sub-group A2</i>						
17.1	Check of dimensions	R		M*		M	
	<i>Sub-group A3</i>						
17.4	Visual inspection (other than marking)	M		M		M	

M = mandatory test

R = recommended test

* Test has changed group or become mandatory

Clause	Test	Test schedule 1	Test schedule 2	Test schedule 3
20	<i>Sub-group A4</i> Dielectric test		M* Further selected terminations not tested in A0 and if Note 1 applies	M Further selected terminations not tested in A0 and if Note 1 applies
22	Insulation resistance			M*
41	<i>Sub-group B1</i> Electrical endurance		R* Only if Notes 1 and 2 apply	R Only if Notes 1 and 2 apply
29	<i>Sub-group B2</i> Heating	R	R	R
30	Rapid change of temperature (Method 2)		M Only for RT II	M Only for RT II
32	Internal moisture	R	Only for RT II and CA 0 both combined	
35	Robustness of terminals		M* Only for RT II	M Only for RT II
36	Solderability (test 1)	M	For printed wiring board relays only	M
54	Magnetic remanence		R For d.c. relays only	R For d.c. relays only
53	<i>Sub-group B3</i> Contact sticking		R Only for RT I and RT II	R Only for RT I and RT II
41	<i>Sub-group C1</i> Electrical endurance		R* Only if not already in B1 and if Note 1 applies	R Only if not already in B1 and if Note 1 applies
19.2	<i>Sub-group C2</i> Coil inductance			R
20	Dielectric test	M	terminals not tested in A0	M Only if not already in A0 or A4
22	Insulation resistance			M
23	Contact-circuit resistance		R Only for CA 2 and CA 3	M* Only for CA 2 and CA 3
25	Timing tests		R	M* Only if not in A1

M = mandatory test

R = recommended test

* Test has changed group or become mandatory

Clause	Test	Test schedule 1	Test schedule 2	Test schedule 3
	<i>Sub-group C3</i>			
17.1	Check of dimensions	R	Not applicable for dimensions checked in A2	
18.2	Mass		R	R
50	Electrical contact noise			R Only for CA 0 and CA 1
	<i>Sub-group C4</i>			
41	Electrical endurance	R	M* Only if not already in B1 or C1	M Only if not already in B1 or C1
42	Mechanical endurance		M See note 4	M See note 4
	<i>Sub-group C5</i>			
26	Climatic sequence	R	R	R
27	Damp heat, steady state	R	R	R
33.1	Salt mist		R Only for RT II	R Only for RT II
35	Robustness of terminals	R	M* Only if not already in B2	M Only if not already in B2
37	Shock Bump Vibration Acceleration	R	R	R
38				
39				
40				
43	Thermal endurance			R
51	Thermoelectric e.m.f.			R Only for CA 0
	<i>Sub-group C6</i>			
28	Thermal resistance		R	R
30	Rapid change of temperature		R Only for RT 0 and RT I	R Only for RT 0 and RT I
34	Mould growth			R
36	Resistance to soldering heat (test 2)		R	R

M = mandatory test

R = recommended test

* Test has changed group or become mandatory

APPENDIX C

QUALITY ASSESSMENT PROCEDURES FOR SHORT PRODUCTION RUNS, FOR ISOLATED LOTS AND FOR SMALL LOTS

Inspection lots shall be formed in accordance with the sampling plans and procedures given in IEC Publication 410 (see Clause 6 of this report), except for short production runs, for isolated lots and for small lots.

C1. Quality assessment procedures for short production runs

A short production run is defined as a production comprising not more than thirty inspection lots (number 30 is under consideration). For each of these lots the procedures for isolated lots should be adopted. However, depending on lot size and AQL, the switching rules will have a greater chance if operating with large lots and low AQL, which may also be considered when determining the sampling plans to be used. These shall be agreed between the manufacturer and the NSI (National Supervising Inspectorate).

C2. Quality assessment procedures for isolated lots

An isolated lot (as distinct from the lot of isolated nature in IEC Publication 410, Sub-clause 11.6) is defined as a unique production or supply lot, not forming part of a current sequence of inspection lots in the quality assessment system.

The following options are available and shall be chosen upon agreement between the manufacturer and the NSI.

- a) 100% inspection if the lot is too small for sampling with adequate discrimination against the release of non-conforming items for the specified AQL and IL (non-destructive tests only).
- b) Change to a sampling plan with an operating characteristic giving adequate protection (DR)* at the LQ and for the known usage of the relays in the lot. The plan to be used shall be agreed between the manufacturer and the NSI and should not unduly increase the producer's risk at the original AQL. The plan chosen may have both different AQL and IL from those specified in the detail specification.

Note. — *DR = discrimination ratio, defined as:

$$\frac{\text{quality level for which } Pa = 10\%}{\text{acceptable quality level}}$$

(see Table VI-A and Table X of IEC Publication 410)

- c) Where good discrimination cannot be obtained, for example for a small lot and a destructive test, a greater sampling risk must be taken and agreement on the plan to be used shall be reached between the manufacturer, the NSI and when known, the ultimate customer (user) of the relays.

C3. Quality assessment procedures for small lots

For small lots, procedures as described in a), b) or c) of the preceding clause may be used and agreed between the manufacturer, the NSI and, when known, the ultimate customer (user) of the relays.

APPENDIX D

EXAMPLE OF MINIMUM TEST SCHEDULES FOR A DETAIL SPECIFICATION
OF A D.C. RELAY WITH NON-SEALED CONTACTS
FOR CONTACT APPLICATION CATEGORIES 0 AND 1

Clause	Test	Schedules			Remarks
		TS 1	TS 2	TS 3	
	<i>Sub-group A0</i>				
17.4	Visual inspection, marking	M	M	M	
19.1	Coil resistance			M	See Notes 1 and 3 (Appendix B)
20	Dielectric test	M	M	M	For specified terminals, see Note 1 (Appendix B)
23	Contact-circuit resistance		M	M	
	<i>Sub-group A1</i>				
18.1	Mechanical tests		R	R	
19.1	Coil resistance	M	M	M	In TS 3 only if not already tested in A0
24	Functional tests	M	M	M	At least two functions
25	Timing tests			R	See Notes 1 and 3 (Appendix B)
	<i>Sub-group A2</i>				
17.1	Check of dimensions	R	M	M	
	<i>Sub-group A3</i>				
17.4	Visual inspection (other than marking)	M	M	M	
	<i>Sub-group A4</i>				
20	Dielectric test		M	M	See Note 1 (Appendix B)
22	Insulation resistance			M	
	<i>Sub-group B1</i>				
41	Electrical endurance		R	R	See Notes 1 and 2 (Appendix B)
	<i>Sub-group B2</i>				
36	Solderability (test 1)	M	M	M	In TS 1 for printed wire board relays only
	<i>Sub-group B3</i>				
	<i>Sub-group C1</i>				
41	Electrical endurance		R	R	Only if not already tested in B1, see Note 1 (Appendix B)

M = mandatory test

R = recommended test

TS = test schedule

Clause	Test	Schedules			Remarks
		TS 1	TS 2	TS 3	
	<i>Sub-group C2</i>				
19.2	Coil inductance			R	
20	Dielectric test	M	M	M	In TS 1: terminals not tested in A0; in TS 2 and TS 3: those not tested in A0 and A4
22	Insulation resistance		M	M	
25	Timing tests			M	
	<i>Sub-group C3</i>				
17.1	Check of dimensions	M			If not already tested in A2
18.2	Mass	R	R	R	
50	Electrical contact noise			R	
	<i>Sub-group C4</i>				
41	Electrical endurance		M	M	See Note 4 (Appendix B) only if not already tested in B1 and C1
42	Mechanical endurance		M	M	
	<i>Sub-group C5</i>				
26	Climatic sequence	R	R	R	Only for CA 0
35	Robustness of terminals		M	M	
43	Thermal endurance			R	
51	Thermoelectric e.m.f.			R	
	<i>Sub-group C6</i>				
28	Thermal resistance		R	R	
30	Rapid change of temperature		R	R	
34	Mould growth			R	
36	Resistance to soldering heat (test 2)		R	R	

M = mandatory test

R = recommended test

TS = test schedule

Note. — In the actual detail specification, the decision must be made whether the recommended tests are applicable; if so, they are mandatory just as any other test prescribed by the detail specification.